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(54) Telemetric transmitter unit

(57) In a telemetric transmitter unit, by means of which signals detected by one electrode (4) or several electrodes connected to the transmitter are wirelessly transmittable to a separate receiver by using a magnetic proximity field, the transmitter electronics (6) is coupled in a fixed manner to each electrode (4) by means of a conductive plastic layer (5). The transmitter electronics (6), the electrodes (4) and the conductive plastic layer (5) are cast and/or jointed together with plastic (1, 2, 3) to form an integrated transmitter unit for use on a belt (12) having electrodes for contacting the chest of a sportsman to monitor EKG signals.

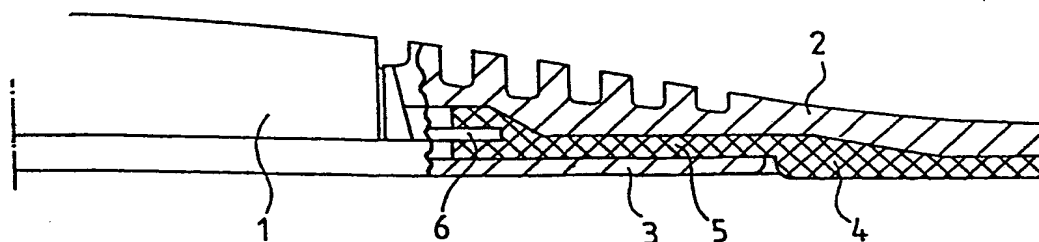


FIG. 1

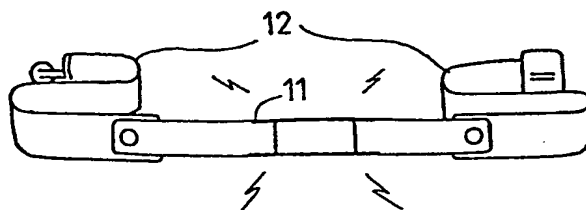


FIG. 5

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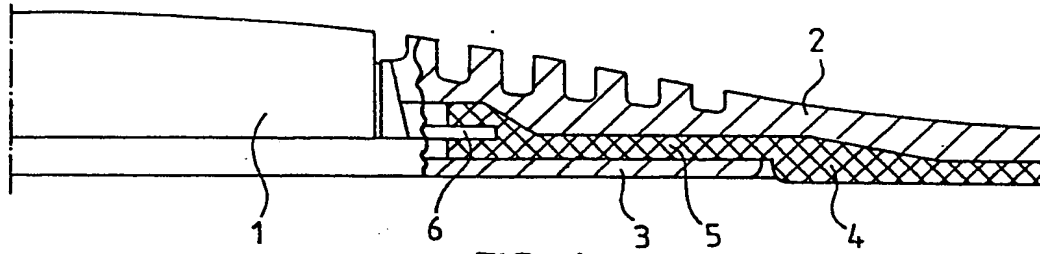


FIG. 1

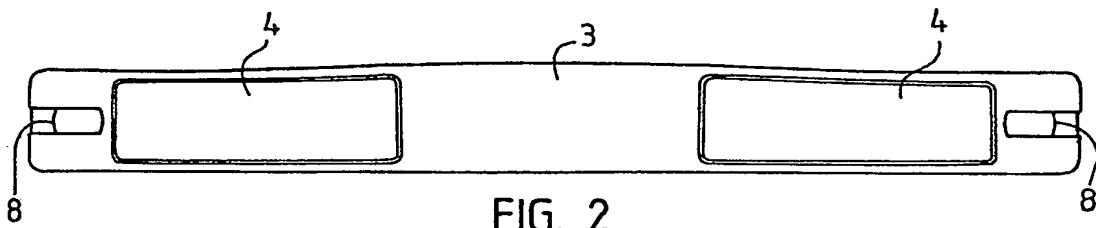


FIG. 2

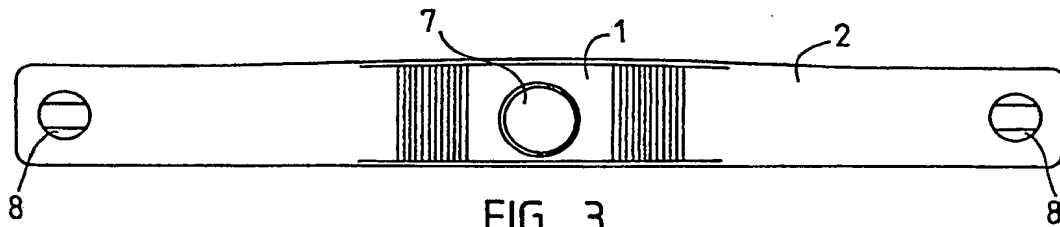


FIG. 3

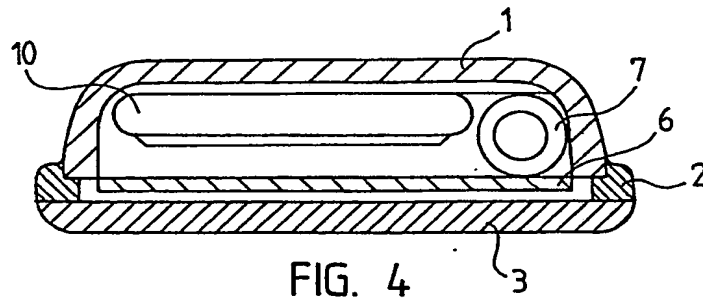


FIG. 4

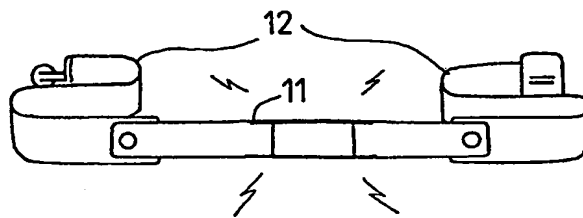


FIG. 5

## Telemetric transmitter unit

The present invention relates to a telemetric transmitter unit, by means of which signals detected by one electrode or several electrodes connected to a transmitter are wirelessly transmittable to a separate receiver by using a magnetic proximity field.

Telemetric data transmission and the techniques required for that are well known, cf. e.g. the telemetric measuring device described in Finnish Patent 68743 and meant for the measurement of pulse and EKG signals. Such a telemetric transmitter mainly consists of transmitter electronics encapsuled in a casing and fastened by means of e.g. two buttons to a belt holding the transmitter in place and of electrodes electrically connected to the transmitter electronics and (2 of them) located on the surface of the belt towards the user's skin on both sides of the transmitter electronics.

In prior art transmitter structures, electrical connections thus comprise four parts, viz. electronics, buttons or corresponding couplings, a conductor from the buttons to the electrodes and the very electrodes. This is a rather complicated transmission path for signals, as it is to be remembered that the circumstances in which e.g. an electrode belt is used are demanding. So for instance an electric connection between the transmitter electronics and the electrodes is dependent on the coupling provided by the buttons, which coupling is sensitive to getting dirty, getting damp, wear etc. Additionally, the conductor between a button and an electrode, cast inside the belt, has to resist big stresses, when the belt is bent, tightened etc.

The object of the present invention is to pro-

vide a telemetric transmitter unit not showing the drawbacks mentioned above. To provide this, the telemetric transmitter unit according to the invention is characterized in that the transmitter electronics is coupled in a fixed manner to each electrode by means of a conductive plastic layer and that the transmitter electronics, the electrodes and the conductive plastic layer are cast and/or jointed together with plastic to form an integrated transmitter unit.

In the transmitter according to the invention, buttons or other fastening means are entirely eliminated, as well as the need of separate conductors between the electrodes and the transmitter electronics. The transmitter unit thus comprises both the transmitter electronics and the electrodes packed in a section forming one whole. By means of the quality, design and treatment at jointing of the various plastic parts, a rather incomparable device has been provided with respect to prior art transmitters, as far as reliability of operation, manageability, durability and also waterproofness are concerned. For instance, an electrically conductive plastic, preferably consisting of conductive polyurethane, combines in a suitable manner two properties of plastic mostly opposite to each other, viz. its conductivity and the elasticity required. Considerable efforts have been necessary to find a suitable combination. A break in the conductive plastic layer e.g. would make the whole transmitter unusable and irreparable in a moment.

The other preferred embodiments of the invention are characterized in what is presented in the claims below.

In the following, the invention will be explained in greater detail by way of examples refer-

ring to the drawings enclosed, in which

Figure 1 is a partial cross-section of a part of a telemetric transmitter according to the invention from the side,

Figure 2 shows the telemetric transmitter of the invention from below,

Figure 3 shows the telemetric transmitter of the invention from above,

Figure 4 is a cross-section of the telemetric transmitter of the invention,

Figure 5 shows the transmitter of the invention fastened to a carrying belt.

A telemetric transmitter of the invention, constructed according to Figure 1, comprises a casing 1 containing transmitter electronics, plastic layers 2, 3 above and below the transmitter, an electrode 4 and a conductive plastic layer 5 connecting the electrode to a printed circuit board 6 of the transmitter electronics. The transmitter electronics 6 is coupled in a fixed manner to the electrode 4 with the conductive plastic layer, and the parts are cast or jointed together in order to unite the plastic layers 2, 3 and the casing 1 to form an integrated transmitter unit.

In use, signals detected by the electrode 4 connected to the transmitter electronics 6 are transmitted wirelessly to a separate receiver by means of a transmitter coil (cf. Figure 4) by using a magnetic proximity field, as presented in the Finnish Patent 68734 mentioned above. That example case relates to the detection of EKG and heartbeat signals e.g. from the chest of a sportsman and to the transmission of amplified signals to a wrist receiver, by means of which the sportsman can follow the development of the pulse. There can be also other signals to be transmitted, information of blood pressure e.g., and the

transmitter can be positioned on a place on the skin of any living being where detectors can detect the signals desired. The only substantial thing for telemetric data transmission is that the transmission takes place wirelessly by detecting in the receiver a pulsating or variable magnetic field generated by the transmitter.

Figure 2 and 3 show the structure of the transmitter as a whole. The transmitter has been formed to a band-like structure provided with means 8 at the ends thereof to be fastened to a carrying belt of the user. The casing 1 containing the transmitter electronics has been formed of a hard polyurethane resistant to wear and shock. Its upper part comprises a cover 7 of a battery casing of the transmitter. The cover can also be omitted, in which case the structure becomes even tighter (cf. Figure 5). The plastic layers 2, 3 above and below the transmitter can preferably be formed of a relatively soft polyurethane in order to provide the necessary elasticity. The transmitter comprises two electrodes 4 positioned symmetrically on both sides of the electronics section in openings made in the plastic layer 3 below the transmitter in order to come into contact with the skin of the user. All parts 1 to 4 have been jointed together in a waterproof manner.

The conductive plastic layer connecting the transmitter electronics to the electrodes is preferably also formed of polyurethane so that the plastic qualities to be joined together have a similar structure and thus form a structure as tight as possible. A suitable grade of electrically conductive polyurethane is e.g. "Polyurethane Estane Compound T4057" manufactured by BF Goodrich Chemical.

Figure 4 shows a cross-section of the casing 1

containing the transmitter electronics. Substantial parts are the very electronics or more correctly the printed circuit board 6 thereof, a transmitter coil 9 and a battery 10.

Figure 5 shows the transmitter 11 of the invention when fastened to a carrying belt 12 to be tightened around the chest of the user. The transmitter in question has no cover for the battery casing. By maximizing the life time of the batteries and by minimizing the current consumption of the transmitter, it is possible to achieve such an operating time by means of one battery that it's not worth while to provide a structure with an opening for a battery exchange.

It is evident for one skilled in the art that the various embodiments of the invention are not restricted to the examples presented above, but that they can vary freely within the scope of the claims given below.

## Claims:

1. A telemetric transmitter unit, by means of which signals detected by one electrode or several electrodes connected to the transmitter are wirelessly transmittable to a separate receiver by using a magnetic proximity field, characterized in that the transmitter electronics (6) is coupled in a fixed manner to each electrode (4) by means of a conductive plastic layer (5) and that the transmitter electronics (6), the electrodes (4) and the conductive plastic layer (5) are cast and/or jointed together with plastic (1, 2, 3) to form an integrated transmitter unit.

2. A transmitter unit according to claim 1, characterized in that the transmitter unit substantially comprises a casing (1) containing the transmitter electronics (6) and the plastic layers (2, 3) above and below the transmitter, which layer (3) below the transmitter has openings for the electrodes (4).

3. A transmitter unit according to claim 2, characterized in that the casing (1) containing the transmitter electronics (6) is formed of a hard polyurethane and the plastic layers (2, 3) above and below the transmitter are formed of a relatively soft polyurethane, which parts have been jointed together in a waterproof manner.

4. A transmitter unit according to claim 1, 2 or 3, characterized in that the conductive plastic layer (5) connecting the transmitter electronics (6) to the electrodes (4) is formed of a conductive polyurethane.

5. A transmitter unit according to one of the claims 1 to 4, characterized in that



the transmitter unit (11) has been formed to a band-like structure provided with means (8) at the ends thereof to be fastened to a carrying belt (12) of the user.

